Contract #: N00014-12-C-0534

Awardee: Lockheed Martin Corporation
1801 State Route 17 C
Owego, NY 13827

Amount Awarded: $13,451,705

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LOCKHEED MARTIN

OPTIMUS
(Open-Architecture Planning and Trajectory Intelligence for Managing Unmanned Systems)
Statement of Work

Document #: 316A500

Dated: April 20, 2012

ONR BAA: 12-004

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I STATEMENT OF WORK

1.0 Base Program (AACUS Task 1)

Period of Performance (POP): Base effort: 8/10/2012-1/31/2014

1.1 Requirements and Design

Objective: Perform the systems engineering analysis to develop a full OPTIMUS system design.

Duration: 12 months

Tasks:

1.1.1 CONOPS Definition
The Contractor shall perform the analysis to define representative missions for CUAS, characterize operational environments, and identify desired system behaviors for each environment/mission pairing.

1.1.2 Simulation and Trade Study Analysis
The Contractor shall identify and perform trade study and simulation analyses needed to fully specify OPTIMUS requirements and design.

1.1.3 Requirements Specification
The Contractor shall generate system requirements for the OPTIMUS system. The requirements will document all assumptions made, define critical tests and performance metrics, and define required interfaces.

1.1.4 Preliminary Design
The Contractor shall define the OPTIMUS physical and functional architecture design to address the system requirements defined in 1.1.3. The design will include the GOAL, individual service definitions, service interfaces, and COTS hardware selections.

1.1.5 GOAL Development
The Contractor shall select a transport service, integrate the transport service into the OPTIMUS architecture, define and implement a standard interface for platform-specific services, and implement a standard interface for OPTIMUS service integration.

1.1.6 Final Design (Demo 1)
The Contractor shall define the OPTIMUS final design, for Demonstration 1. The design shall represent the configuration for flight demonstrations, to include the hardware and software, as referenced in sections 1.2, 1.3, 1.4 and 1.5 below.

Deliverables: Technology Maturation Plan, System Requirements Review Agenda, System Requirements Review Presentation, System Requirements Review Minutes, Preliminary Design Review Agenda, Preliminary Design Review Presentation, Preliminary Design Review Minutes, Critical Design Review Agenda, Critical Design Review Presentation, Critical Design Review Minutes

1.2 All-Weather Sensor Suite

Objective: Produce an integrated sensor suite for Task 1 demonstration.

Duration: 12 months

Tasks:

1.2.1 Sensor Suite Specification and Design

The Contractor shall identify and characterize the individual sensor components of the OPTIMUS All-Weather Sensor Suite. This design will include the definition of individual ICDs for each sensor type identified.

1.2.2 Sensor Development

The Contractor shall perform modifications to the development sensor design to achieve base effort performance goals.

1.2.3 Sensor Suite Integration

The Contractor shall acquire the necessary COTS sensors needed to construct a complete sensor package to meet base effort sensing requirements and develop the necessary adapters to integrate all base effort sensors with the GOAL.

Deliverables: Sensor Package Design (Demo 1)

1.3 Perception and Understanding

Objective: Produce a suite of sensor data fusion, sensor data interpretation, and world modeling services to meet OPTIMUS base effort demonstration goals.

Duration: 16 months

Tasks:

1.3.1 Active Sensor Control Service Development

The Contractor shall implement a GOAL service that provides context-based tasking of the All-Weather Sensors during CUAS mission execution to meet base effort demonstration requirements.

1.3.2 Data Fusion/Correlation Service Development

The Contractor shall implement a GOAL service that aligns incoming sensor data with prior processed data to generate and populate the World Model with a consistent, up-to-date understanding of CUAS and its environment's state.

1.3.3 World Model Service Development

The Contractor shall implement a GOAL service that constructs and maintains a consistent 3D representation of the CUAS mission environment and supports rapid queries by other OPTIMUS services.

1.3.4 Obstacle Identification Service Development

The Contractor shall implement a GOAL service that detects, classifies, and tracks static and dynamic obstacles in the LZ during CUAS translational flight and descent.

1.3.5 Landing Zone Identification Service Development

The Contractor shall implement a GOAL service that rates potential landing sites for CUAS landability and flight personnel traversability.

Deliverables: None

1.4 Autonomous Action

Objective: Produce a suite of CUAS planning, maneuver, and contingency management services to meet OPTIMUS base effort demonstration goals.

Duration: 16 months

Tasks:

1.4.1 Contingency Management Service Development

The Contractor shall implement a GOAL service that monitors and assesses risk to mission success and works with other GOAL services to respond to those contingencies that seriously impact mission performance.

1.4.2 Behavior Selection Service Development

The Contractor shall implement a GOAL service that manages the overall OPTIMUS decision-making process, including defining planning cost functions and parameters and selecting among candidate LZs.

1.4.3 Motion Planning Service Development

The Contractor shall implement a GOAL service that generates paths from current airframe pose to the desired target location and pose.

1.4.4 Trajectory Generation Tool

The Contractor shall implement a standalone utility that constructs a trajectory library of candidate maneuvers for use by the Motion Planning service for a given CUAS and mission.

Deliverables: None

1.5 Human-Machine Interaction

Objective: Produce a supervisory control interface for Field Operator System and GCS-based interaction with the autonomy system to meet OPTIMUS base effort demonstration goals.

Duration: 16 months

Tasks:

1.5.1 Field Operator System (FOS)

The Contractor shall perform cognitive task analysis, usability design, implement, integrate, and evaluate the usability of a portable hand-held interface for the Field Operator to support OPTIMUS base effort demonstration goals. The FOS will support the Field Operator to issue commands, supervise CUAS mission

execution, identify candidate LZ areas, indicate the presence of threats, and signal wave-off/abort.

1.5.2 Ground Control Station (GCS)

The Contractor shall perform cognitive task analysis, usability design and implement functionality to supervision of OPTIMUS functions by a GCS operator. The Contractor shall integrate these interface functions with an existing GCS and evaluate the usability of the interface for the GCS operator to support OPTIMUS base effort demonstration goals. The GCS will support the operator to issue commands, plan and supervise CUAS mission execution.

Deliverables: FOS Interface Design, GCS Interface Design

1.6 Integration and Test

Objective: Produce an integrated, tested OPTIMUS system that meets OPTIMUS base effort requirements for flight test and demonstration.

Duration: 14 months

Tasks:

1.6.1 System Integration Lab (SIL)

The Contractor shall design and build a System Integration Lab that provides high-fidelity simulation of base effort and Option 1 target platform systems and missions.

1.6.2 Test Planning

The Contractor shall develop a program test plan that describes test scenarios, facilities, schedule, objectives, and procedures for validating and verifying OPTIMUS capabilities.

1.6.3 Integration

The Contractor shall integrate the services developed in tasks 1.2-1.5 into the GOAL and install the integrated system into the SIL for testing.

1.6.4 SIL Testing

The Contractor shall perform system-level tests to verify the base effort OPTIMUS system meets or exceeds base effort requirements using the high-fidelity SIL.

Deliverables: Test Readiness Review Agenda, Test Readiness Review Presentation, Test Readiness Review Minutes

1.7 Verification and Demonstration

Objective: Demonstrate the integrated OPTIMUS system from task 1.6 meets base effort requirements through flight testing and demonstration of OPTIMUS controlling a CUAS.

Duration: 5 months

Tasks:

1.7.1 Platform Integration
The Contractor shall integrate the fully tested base effort OPTIMUS system onto the CUAS and verify readiness to test.

1.7.2 Development Flight Testing
The Contractor shall plan and perform incremental flight testing of the OPTIMUS-controlled CUAS performing cargo delivery missions including all required specialty engineering tasks and airworthiness documentation.

1.7.3 Flight Demonstration
The Contractor shall perform a flight demonstration of OPTIMUS controlling a CUAS through a specified cargo delivery mission.

Deliverables: Demonstration Test Plan, Demonstration Test Report

1.8 Program Management

Objective: Manage the resources of the OPTIMUS program to ensure timely, high-quality deliveries of base effort deliverables to the Government.

Duration: 18 months

Tasks:

1.8.1 Program Management Plan
The Contractor shall develop a Program Management Plan (PMP) that includes processes and procedures to address organizational roles and responsibilities, program business rhythm, cost and schedule management approach, requirements management and metric reporting, conflict resolution approach, export controls (ITAR) and Technical Advisory Board communication with the AACUS Advisory Group. The PMP shall include processes for risk and opportunity management and configuration management as shown below.

1.8.1.1 Risk and Opportunity Management
Within the PMP, the Contractor shall develop and execute a risk and opportunities management plan that describes the process of risk/opportunity identification, analysis, mitigation/implementation planning, and status monitoring.

1.8.1.2 Configuration Management
Within the PMP, the Contractor shall develop and execute a configuration management and data management plan to apply technical and administrative oversight of the program's baseline for the life of the contract. This encompasses configuration baseline identification and control for software, hardware, documents, program trouble reports, change proposals and project plans. The Contractor will maintain a common data repository and provide access to the Customer.

1.8.2 Program Management Execution
The Contractor shall perform all duties required to manage OPTIMUS program execution, including: cost, schedule, technical oversight, subcontractor

management, progress reporting, and issue resolution. The Contractor will support collaboration with ONR and other ONR-identified stakeholders, hosting regular technical interchange meetings and supporting bi-weekly ONR customer phone calls. The Contractor shall report detailed technical progress to ONR monthly, to also include software development status and risk and opportunities status reports.

Deliverables: Kick-off Meeting Agenda, Kick-off Meeting Presentation, Kick-off Meeting Minutes, Monthly Program Status Reports, Semi-Annual Reports, Program Management Plan

2.0 Option 1 (AACUS Task 2)

Period of Performance (POP): Option 1: 2/1/2014-12/31/2014

2.1 Requirements and Design

Objective: Perform the systems engineering analysis to develop a full OPTIMUS system design.

Duration: 6 months

Tasks:

2.1.1 Requirements Specification
The Contractor shall generate Option 1 system requirements for the OPTIMUS system based on planned enhancements and lessons learned from base effort execution. The requirements will document all assumptions made, define critical tests and performance metrics, and define required interfaces.

2.1.2 Preliminary Design
The Contractor shall enhance the OPTIMUS physical and functional architecture design to address new or modified system requirements defined in 2.1.1. The design will include updates to the GOAL, individual service definitions, service interfaces, and COTS hardware selections.

2.1.3 GOAL Development
The Contractor shall enhance the base effort GOAL with design modifications defined in 2.1.2.

2.1.4 Final Design (Demo 2)
The Contractor shall define the OPTIMUS design for Demonstration 2. The design shall represent the configuration for flight demonstration, to include the hardware and software, as referenced in sections 2.2, 2.3, 2.4 and 2.5.

Deliverables: Preliminary Design Review Agenda, Preliminary Design Review Presentation, Preliminary Design Review Minutes, GOAL software (with source code), Critical Design Review Agenda, Critical Design Review Presentation, Critical Design Review Minutes

2.2 All-Weather Sensor Suite

Objective: Produce an integrated sensor suite for Task 2 demonstration.

Duration: 6 months

Tasks:

2.2.1 Long-Lead Sensor Trade Study Analysis
The Contractor shall perform trade studies and analysis needed to fully specify OPTIMUS sensing requirements and design to achieve overall OPTIMUS performance objectives.

2.2.2 Sensor Suite Updates
The Contractor shall update sensor ICDs, sensor driver software, and the development sensor to account for design modifications defined in 2.1.2.

Deliverables: Sensor Package Design for Demo 2

2.3 Perception and Understanding

Objective: Produce a suite of sensor data fusion, sensor data interpretation, and world modeling services to meet OPTIMUS Option 1 demonstration goals.

Duration: 6 months

Tasks:

2.3.1 Service Update
The Contractor shall enhance the Active Sensor Control, Data Fusion/Correlation, World Model, Obstacle Identification, and Landing Zone services to meet the Option 1 requirements identified in 2.1.1.

Deliverables: Perception and understanding software (with source code) developed for OPTIMUS as part of the GOAL software package

2.4 Autonomous Action

Objective: Produce a suite of CUAS planning, maneuver, and contingency management services to meet OPTIMUS Option 1 demonstration goals.

Duration: 6 months

Tasks:

2.4.1 Service Update
The Contractor shall enhance Contingency Management, Behavior Selection, and Motion Planning services as well as the Trajectory Generation Tool to meet the Option 1 requirements identified in 2.1.1.

Deliverables: Autonomous Action software (with source code) developed for OPTIMUS as part of the GOAL software package

2.5 Human-Machine Interface

Objective: Produce a supervisory control interface for FOS and GCS-based interaction with the autonomy system to meet OPTIMUS base effort demonstration goals.

Duration: 6 months

Tasks:

2.5.1 HMI Updates

The Contractor shall enhance the OPTIMUS FOS and GCS to meet Option 1 demonstration goals. This includes performing usability design, implementation, integration, and usability testing of the modified interfaces.

2.5.2 On-Vehicle Interface (OVI)

The Contractor shall perform usability design, implement, integrate, and test the usability of a vehicle-mounted interface for the Field Operator to support OPTIMUS base effort demonstration goals. The OVI will support the Field Operator to issue a takeoff command, controlling platform lights for signaling the Field Operator.

Deliverables: FOS Interface Design, OVI Interface Design, GCS Interface Design

2.6 Integration and Test

Objective: Produce an integrated, tested OPTIMUS system that meets OPTIMUS base effort requirements for flight test and demonstration.

Duration: 6 months

Tasks:

2.6.1 Integration

The Contractor shall integrate the services developed in tasks 2.2-2.5 into the GOAL and install the integrated system into the SIL for testing.

2.6.2 SIL Testing

The Contractor shall perform system-level tests to verify the base effort OPTIMUS system meets or exceeds Option 1 requirements using the high-fidelity SIL.

Deliverables: Test Readiness Review Agenda, Test Readiness Review Presentation, Test Readiness Review Minutes

2.7 Verification and Demonstration

Objective: Demonstrate the integrated OPTIMUS system from task 2.6 meets base effort requirements through flight testing and demonstration of OPTIMUS controlling a second modified CUAS.

Duration: 5 months

Tasks:

2.7.1 Platform Integration
The Contractor shall integrate the fully tested Option 1 OPTIMUS system onto the CUAS and verify readiness to test.

2.7.2 Development Flight Testing
The Contractor shall perform incremental flight testing of the OPTIMUS-controlled CUAS performing cargo delivery missions.

2.7.3 Flight Demonstration
The Contractor shall perform a flight demonstration of OPTIMUS controlling a CUAS through a specified cargo delivery mission, including all required specialty engineering tasks and airworthiness documentation.

Deliverables: Demonstration Test Plan, Demonstration Test Report

2.8 Program Management

Objective: Manage the resources of the OPTIMUS program to ensure timely, high-quality deliveries of Option 1 deliverables to the Government.

Duration: 11 months

Tasks:

2.8.1 Program Management Execution
In accordance with the PMP (see Section 1.8), the Contractor shall perform all duties required to manage OPTIMUS program execution, including: cost, schedule, technical oversight, subcontractor management, progress reporting, and issue resolution. The Contractor will support collaboration with ONR and other ONR-identified stakeholders, hosting regular technical interchange meetings and supporting bi-weekly ONR customer phone calls. The Contractor shall report detailed technical progress to ONR monthly, to also include software development status and ROMB status reports.

Deliverables: Option 1 Kick-Off Meeting Agenda, Option 1 Kick-off Meeting Presentation, Option 1 Kick-off Meeting Minutes, Monthly Program Status Reports, Semi-Annual Reports

3.0 Option 2 (AACUS Task 3)

Period of Performance: Option 2: 1/1/2015-1/31/2016

3.1 Requirements and Design

Objective: Perform the systems engineering analysis to develop a full OPTIMUS system design.

Duration: 8 months

Tasks:

3.1.1 Requirements Specification

The Contractor shall generate Option 2 system requirements for the OPTIMUS system based on planned enhancements and lessons learned from Option 1 execution. The requirements will document all assumptions made, define critical tests and performance metrics, and define required interfaces.

3.1.2 Preliminary Design

The Contractor shall enhance the OPTIMUS physical and functional architecture design to address new or modified system requirements defined in 3.1.1. The design will include updates to the GOAL, individual service definitions, service interfaces, and COTS hardware selections.

3.1.3 GOAL Development

The Contractor shall enhance the base effort GOAL with design modifications defined in 3.1.2.

3.1.4 Final Design (Demo 3)

The Contractor shall define the OPTIMUS design for Demonstration 2. The design shall represent the configuration for flight demonstration, to include the hardware and software, as referenced in sections 3.2, 3.3, 3.4 and 3.5.

Deliverables: Preliminary Design Review Agenda, Preliminary Design Review Presentation, Preliminary Design Review Minutes, GOAL software (with source code), Critical Design Review Agenda, Critical Design Review Presentation, Critical Design Review Minutes

3.2 All-Weather Sensor Suite

Objective: Produce an integrated sensor suite for Option 2 demonstration.

Duration: 6 months

Tasks:

3.2.1 Long-Lead Sensor Trade Study Analysis

The Contractor shall perform trade studies and analysis needed to fully specify OPTIMUS sensing requirements and design to achieve overall OPTIMUS performance objectives.

3.2.2 Sensor Suite Updates

The Contractor shall update sensor ICDs, sensor driver software, and the development sensor to account for design modifications defined in 3.1.2.

Deliverables: Sensor Package Design for Demo 3

3.3 Perception and Understanding

Objective: Produce a suite of sensor data fusion, sensor data interpretation, and world modeling services to meet OPTIMUS Option 2 demonstration goals.

Duration: 6 months

Tasks:

3.3.1 Service Update

The Contractor shall enhance the Active Sensor Control, Data Fusion/Correlation, World Model, Obstacle Identification, and Landing Zone services to meet the Option 2 requirements identified in 3.1.1.

Deliverables: Perception and understanding software (with source code) developed for OPTIMUS as part of the GOAL software package

3.4 Autonomous Action

Objective: Produce a suite of CUAS planning, maneuver, and contingency management services to meet OPTIMUS Option 2 demonstration goals.

Duration: 6 months

Tasks:

3.4.1 Service Update

The Contractor shall enhance Contingency Management, Behavior Selection, and Motion Planning services as well as the Trajectory Generation Tool to meet the Option 2 requirements identified in 3.1.1.

Deliverables: Autonomous Action software (with source code) developed for OPTIMUS as part of the GOAL software package

3.5 Human-Machine Interface

Objective: Produce a supervisory control interface for Field Operator and GCS-based interaction with the autonomy system to meet OPTIMUS base effort demonstration goals.

Duration: 6 months

Tasks:

3.5.1 HMI Updates

The Contractor shall enhance the OPTIMUS FOS, OVI and GCS to meet Option 2 demonstration goals. This includes performing usability design, implementation, integration, and usability testing of the modified interfaces.

Deliverables: FOS Interface Design, OVI Interface Design, GCS Interface Design

3.6 Integration and Test

Objective: Produce an integrated, tested OPTIMUS system that meets OPTIMUS base effort requirements for flight test and demonstration.

Duration: 6 months

Tasks:

3.6.1 Integration

The Contractor shall integrate the services developed in tasks 3.2-3.5 into the GOAL and install the integrated system into the SIL for testing.

3.6.2 SIL Testing

The Contractor shall perform system-level tests to verify the base effort OPTIMUS system meets or exceeds Option 1 requirements using the high-fidelity SIL.

Deliverables: Test Readiness Review Agenda, Test Readiness Review Presentation, Test Readiness Review Minutes

3.7 Verification and Demonstration

Objective: Demonstrate the integrated OPTIMUS system from task 3.6 meets Option 2 requirements through flight testing and demonstration of OPTIMUS controlling the first CUAS.

Duration: 5 months

Tasks:

3.7.1 Platform Integration

The Contractor shall integrate the fully tested Option 2 OPTIMUS system onto the CUAS and verify readiness to test.

3.7.2 Development Flight Testing

The Contractor shall perform incremental flight testing of the OPTIMUS-controlled CUAS performing cargo delivery missions, including all required specialty engineering tasks and airworthiness documentation.

3.7.3 Flight Demonstration

The Contractor shall perform a flight demonstration of OPTIMUS controlling a CUAS through a specified cargo delivery mission.

Deliverables: Demonstration Test Plan, Demonstration Test Report

3.8 Program Management

Objective: Manage the resources of the OPTIMUS program to ensure timely, high-quality deliveries of Option 2 deliverables to the Government.

Duration: 13 months

Tasks:

3.8.1 Program Management Execution

In accordance with the PMP (see Section 1.8), the Contractor shall perform all duties required to manage OPTIMUS program execution, including: cost, schedule, technical oversight, subcontractor management, progress reporting, and issue resolution. The Contractor will support collaboration with ONR and other ONR-identified stakeholders, hosting regular technical interchange meetings and

supporting bi-weekly ONR customer phone calls. The Contractor shall report detailed technical progress to ONR monthly, to also include software development status and ROMB status reports.

Deliverables: Option 2 Kick-off Meeting Agenda, Option 2 Kick-off Meeting Presentation, Option 2 Kick-off Meeting Minutes, Monthly Program Status Reports, Semi-Annual Reports

4.0 Option 3 (AACUS Tasks 4-5)

Period of Performance: Option 3: 2/2/2016-9/29/2017

4.1 Requirements and Design

Objective: Perform the systems engineering analysis to develop a full OPTIMUS system design.

Duration: 7 months

Tasks:

4.1.1 Requirements Specification
The Contractor shall generate Option 3 system requirements for the OPTIMUS system based on planned enhancements and lessons learned from base effort execution. The requirements will document all assumptions made, define critical tests and performance metrics, and define required interfaces.

4.1.2 Preliminary Design
The Contractor shall enhance the OPTIMUS physical and functional architecture design to address new or modified system requirements defined in 4.1.1. The design will include updates to the GOAL, individual service definitions, service interfaces, and COTS hardware selections.

4.1.3 GOAL Development
The Contractor shall enhance the base effort GOAL with design modifications defined in 4.1.2.

4.1.4 Final Design (Demo 4)
The Contractor shall define the OPTIMUS design for Demonstration 2. The design shall represent the configuration for flight demonstration, to include the hardware and software, as referenced in sections 4.2, 4.3, 4.4 and 4.5.

Deliverables: Preliminary Design Review Agenda, Preliminary Design Review Presentation, Preliminary Design Review Minutes, GOAL software (with source code), Critical Design Review Agenda, Critical Design Review Presentation, Critical Design Review Minutes

4.2 All-Weather Sensor Suite

Objective: Produce an integrated sensor suite for Option 3 demonstration.

Duration: 6 months

Tasks:

4.2.1 Long-Lead Sensor Trade Study Analysis

The Contractor shall perform trade studies and analysis needed to fully specify OPTIMUS sensing requirements and design to achieve overall OPTIMUS performance objectives.

4.2.2 Sensor Suite Updates

The Contractor shall update sensor ICDs, sensor driver software, and the development sensor to account for design modifications defined in 4.1.2.

Deliverables: Sensor Package Design for Demo 4

4.3 Perception and Understanding

Objective: Produce a suite of sensor data fusion, sensor data interpretation, and world modeling services to meet OPTIMUS Option 3 demonstration goals.

Duration: 6 months

Tasks:

4.3.1 Service Update

The Contractor shall enhance the Active Sensor Control, Data Fusion/Correlation, World Model, Obstacle Identification, and Landing Zone services to meet the Option 3 requirements identified in 4.1.1.

Deliverables: Perception and understanding software (with source code) developed for OPTIMUS as part of the GOAL software package

4.4 Autonomous Action

Objective: Produce a suite of CUAS planning, maneuver, and contingency management services to meet OPTIMUS Option 3 live flight demonstration goals.

Duration: 6 months

Tasks:

4.4.1 Service Update

The Contractor shall enhance Contingency Management, Behavior Selection, and Motion Planning services as well as the Trajectory Generation Tool to meet the Option 3 requirements identified in 4.1.1.

Deliverables: Autonomous Action software (with source code) developed for OPTIMUS as part of the GOAL software package

4.5 Human-Machine Interface

Objective: Produce a supervisory control interface for Field Operator and GCS-based interaction with the autonomy system to meet OPTIMUS base effort demonstration goals.

Duration: 6 months

Tasks:

4.5.1 HMI Updates

The Contractor shall enhance the OPTIMUS FOS, OVI and GCS to meet Option 3 demonstration goals. This includes performing usability design, implementation, integration, and usability testing of the modified interfaces.

Deliverables: FOS Interface Design, OVI Interface Design, GCS Interface Design

4.6 Integration and Test

Objective: Produce an integrated, tested OPTIMUS system that meets OPTIMUS base effort requirements for flight test and demonstration.

Duration: 6 months

Tasks:

4.6.1 Integration

The Contractor shall integrate the services developed in tasks 4.2-4.5 into the GOAL and install the integrated system into the SIL for testing.

4.6.2 SIL Testing

The Contractor shall perform system-level tests to verify the base effort OPTIMUS system meets or exceeds Option 3 requirements using the high-fidelity SIL.

Deliverables: Test Readiness Review Agenda, Test Readiness Review Presentation, Test Readiness Review Minutes

4.7 Verification and Demonstration

Objective: Demonstrate the integrated OPTIMUS system from task 4.6 meets Option 3 requirements through flight testing and demonstration of OPTIMUS controlling both modified CUASs.

Duration: 5 months

Tasks:

4.7.1 Platform 1 Integration

The Contractor shall integrate the fully tested Option 3 OPTIMUS system onto the first CUAS and verify readiness to test.

4.7.2 Platform 2 Integration

The Contractor shall integrate the fully tested Option 3 OPTIMUS system onto the second modified CUAS and verify readiness to test.

4.7.3 Development Flight Testing

The Contractor shall perform incremental flight testing of the OPTIMUS-controlled CUASs performing cargo delivery and CASEVAC missions, including all required specialty engineering tasks and airworthiness documentation.

4.7.4 Flight Demonstration

The Contractor shall perform a flight demonstration of OPTIMUS controlling both CUASs through a specified multi-drop cargo delivery and CASEVAC mission.

Deliverables: Demonstration Test Plan, Demonstration Test Report

4.8 Transition Documentation

Objective: Produce an actionable transition documents for the OPTIMUS technology.

Duration: 12 months

Tasks:

4.8.1 Transition Plan Development

The Contractor shall develop and deliver a Transition Plan for the overall sensor package and the open architecture layer that includes specific details on testing with a DoD facility. This plan will include a System Engineering Management Plan containing planning and implementation information; a Master Test Plan describing a Validation and Verification process for OPTIMUS, including testing at one or more Department of Defense facilities; an Information Assurance Plan detailing methods to protect and defend information and information systems within OPTIMUS; a SWaP-C Reduction Plan proposing methods for reducing system Space, Weight, Power, and Cooling requirements; and an Airworthiness Certification Plan, defining applicable certification criteria to be applied to OPTIMUS and a methodology for achieving that criteria.

4.8.2 Interface Control Document

The Contractor shall develop and deliver an Interface Control Document for the overall system, including the GOAL and defined services.

Deliverables: Transition Plan, Interface Control Document

4.9 Future CUAS Demonstration

Objective: Demonstrate OPTIMUS on a notional future CUAS

Duration: 9 months

Tasks:

4.9.1 Transformer Integration

The Contractor shall integrate the final OPTIMUS system prototype into a simulation of a future CUAS to demonstrate ease of OPTIMUS transition and degree of platform agnostic integration support.

4.9.2 Transformer Demonstration

The Contractor shall provide a simulated demonstration of OPTIMUS guiding the simulated future CUAS through a CUAS mission, with specific focus on showing high speed (e.g., 250 KIAS) operation within the 2 minute approach and land objective timeline.

Deliverables: Demonstration Report

4.10 Program Management

Objective: Manage the resources of the OPTIMUS program to ensure timely, high-quality deliveries of Option 3 deliverables to the Government.

Duration: 21 months

Tasks:

4.10.1 Program Management Execution

In accordance with the PMP (see Section 1.8), the Contractor shall perform all duties required to manage OPTIMUS program execution, including: cost, schedule, technical oversight, subcontractor management, progress reporting, and issue resolution. The Contractor will support collaboration with ONR and other ONR-identified stakeholders, hosting regular technical interchange meetings and supporting bi-weekly ONR customer phone calls. The Contractor shall report detailed technical progress to ONR monthly, to also include software development status and ROMB status reports.

4.10.2 Final Report

The Contractor shall write a Final Report that includes a cost benefit analysis for the design and implementation of the GOAL, performance analysis for the OPTIMUS system, and lessons learned derived from the overall OPTIMUS effort.

Deliverables: Option 3 Kick-off Meeting Agenda, Option 3 Kick-off Meeting Presentation, Option 3 Kick-off Meeting Minutes, Monthly Program Status Reports, Semi-Annual Reports, Final Report.

II Deliverables

The following deliverables shall be submitted in accordance with this SOW:

Notes for Major Meetings/Reviews called out below:

1. Review packages will be distributed later than 5 working days in advance of the review
2. Agendas will be distributed 3 working days prior to a meeting
3. Draft meeting minutes will be distributed 3 working days after a meeting
4. Final meeting minutes will be recorded and distributed 10 working days after a meeting

Base Program

Task 1: 18 mo. POP: Aug 2012 – Jan 2014

1. Kick Off Meeting and Presentation (1 month after contract start)
2. Project Management Plan (1 month after contract start)
3. Monthly Program Status Reports (monthly)
4. Semi-Annual Reports (6, 12, 18 months after contract start)
5. Technology Maturation Plan (3 months after contract start)
6. System Requirements Review Presentation (5 months after contract start)
7. Preliminary Design Review Presentation (8 months after contract start)
8. Critical Design Review Presentation (11 months after contract start)
9. Test Readiness Review Presentation (15 months after contract start)
10. Demonstration Test Plan (11 months after contract start)
11. Demonstration Test Report (18 months after contract start)
12. Sensor Package Design for Demo Platform 1 (18 months after contract start)
13. FOS Interface Design (18 months after contract start)
14. GCS Interface Design (18 months after contract start)

Option 1

Task 2: 11 mo. POP: Feb 2014 – Dec 2014

1. Option 1 Kick Off Meeting Presentation (1 month after contract option start)
2. Monthly Program Status Reports (monthly)
3. Semi-Annual Reports (6, 11 months after contract option start)
4. Preliminary Design Review Presentation (3 months after contract option start)
5. Critical Design Review Presentation (6 months after contract option start)
6. Test Readiness Review Presentation (9 months after contract option start)
7. Demonstration Test Plan (6 months after contract option start)
8. Demonstration Test Report (11 months after contract option start)
9. Sensor Package Design for Demo Platform 2 (11 months after contract option start)
10. Global open architecture layer software (with source code) (11 months after contract option start)
11. FOS Interface Design (11 months after contract option start)
12. OVI Interface Design (11 months after contract option start)
13. GCS Interface Design (11 months after contract option start)

Option 2

Task 3: 13 mo. POP: Jan 2015 – Jan 2016
1. Kick Off Meeting Presentation (1 month after contract option start)
2. Monthly Program Status Reports (monthly)
3. Semi-Annual Reports (6, 12 months after contract option start)
4. Preliminary Design Review Presentation (4 months after contract option start)
5. Critical Design Review Presentation (7 months after contract option start)
6. Test Readiness Review Presentation (11 months after contract option start)
7. Demonstration Test Plan (7 months after contract option start)
8. Demonstration Test Report (13 months after contract option start)
9. Sensor Package Design for Demo 3 (13 months after contract option start)
10. FOS Interface Design (13 months after contract option start)
11. OVI Interface Design (13 months after contract option start)
12. GCS Interface Design (13 months after contract option start)

Option 3

Tasks 4-5: 20 mo. POP: Feb 2016 – Sep 2017
1. Kick Off Meeting Presentation (1 month after contract option start)
2. Monthly Program Status Reports (monthly)
3. Semi-Annual Reports (6, 12, 18 months after contract option start)
4. Preliminary Design Review Presentation (3 months after contract option start)
5. Critical Design Review Presentation (6 months after contract option start)
6. Test Readiness Review Presentation (9 months after contract option start)
7. Demonstration Test Plan (6 months after contract option start)
8. Demonstration Test Reports (11 months after contract option start)
9. Sensor Package Design for Demo 4 (11 months after contract option start)
10. Global open architecture layer software (with source code) (11 months after contract option start)
11. FOS Interface Design (11 months after contract option start)
12. OVI Interface Design (11 months after contract option start)
13. GCS Interface Design (11 months after contract option start)
14. Kick Off Meeting Presentation/Transition Plan (7 months after contract option start)
15. Future UAS Simulation Critical Design Review Presentation (14 months after contract option start)
16. Future UAS Simulation Test Readiness Review Presentation (18 months after contract option start)
17. Future UAS Simulation Test Report (20 months after contract option start)
18. Final Program Report (20 months after contract option start)
19. Interface Control Document (20 months after contract option start)